PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-267926

(43)Date of publication of application : 15.10.1996

(51)Int.Cl. B41M 5/26
G11B 7/24

(21)Application number : 07-099945

(22)Date of filing : 31.03.1995

(71)Applicant : TDK CORP

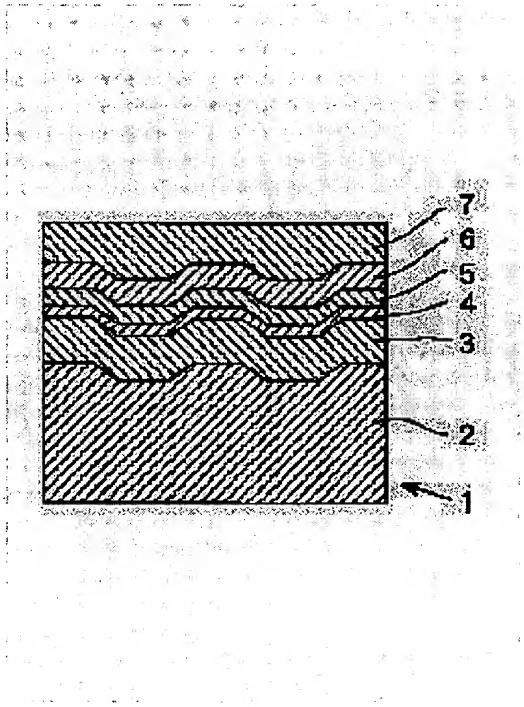
(72)Inventor : TOMINAGA JUNJI
INABA AKIRA
KOSUDA MASANORI
KATO TATSUYA

(54) OPTICAL RECORDING MEDIUM

(57)Abstract:

PURPOSE: To provide a phase change type optical recording medium enabling overwriting at high linear velocity and showing sufficient reliability even when preserved under high temp. environment.

CONSTITUTION: In a optical recording medium 1 wherein a phase change type recording layer 4 is provided on a substrate 2, the main component of the recording layer 4 is represented by formula {(AaBbCc)1-dDd}1-eEe (wherein A is Ag and/or Au, B is Sb and/or Bi, C is Te and/or Se, D is In or In and Al and/or P, E is at least one element selected from Se, Ge, Sn and Pb and a, b, c, d and e are an atomic ratio and are $0.001 \leq a \leq 0.20$, $0.40 \leq b \leq 0.90$, $0.10 \leq c \leq 0.50$, $a+b+c=1$, $0 < d \leq 0.6$ and $0.001 \leq e \leq 0.10$).



LEGAL STATUS

[Date of request for examination] 22.12.1997

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	3150267
[Date of registration]	19.01.2001
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The optical recording medium which has the record layer of a phase change mold on a substrate and by which the principal component of a record layer is expressed with the following formula.
Formula {(Aa Bb Cc) 1-d Dd}1-e Ee (in the above-mentioned formula, A is Ag and/or Au, B is Sb and/or Bi, C is Te and/or Se, D is In, or is In and aluminum, and/or P, and E is at least one sort of elements chosen from Si, germanium, Sn, and Pb.) Moreover, a, b, c, d, and e express an atomic ratio, and are 0.001<=a<=0.20, 0.40<=b<=0.90, 0.10<=c<=0.50, a+b+c=1, 0< d<=0.06, and 0.001<=e<=0.10.
[Claim 2] The optical recording medium of claim 1 whose ratio of M in a record layer a record layer is below pentatomic % including M (M is at least one sort of elements chosen from Ti, Zr, Hf, V, Nb, Ta, Mn, W, and Mo).

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the optical recording medium which records information using change of the crystallized state of the record layer by light beam exposure.
[0002]
[Description of the Prior Art] In recent years, the optical recording medium [high density record is possible and] which can moreover eliminate and rewrite recording information attracts attention. Among the optical recording media of a rewritable mold, by irradiating laser light, the optical recording medium of a phase change mold changes the crystallized state of a record layer, and detects reflection factor change of the record layer accompanying such a change of state. Over-writing by the single light beam is possible for the optical recording medium of a phase change mold, and since it is simple compared with it of a magneto-optic-recording medium, the optical system of a driving gear attracts attention.
[0003] Although a germanium-Te system ingredient is used for it by the crystallized state and the amorphous state in many cases since the stability of that the difference of a reflection factor is large and an amorphous state is comparatively high to the optical recording medium of a phase change mold, applying the compound called KARUKO pyrite recently is proposed.
[0004] A KARUKO pyrite mold compound is widely studied as a compound semiconductor ingredient, and is applied to the solar battery etc. A KARUKO pyrite mold compound is Ib-IIIb-VIb2 and IIb-IVb-Vb2, when the chemistry periodic table is used. It is the presentation expressed and has the structure which accumulated two diamond structures. a KARUKO pyrite mold compound -- X-ray structural analysis -- easy -- structure -- it can determine -- the fundamental property -- for example, monthly FIJIKUSU vol.8 and No. -- 8, 1987, pp-441, electrochemistry vol.56, and No. -- 4, 1988, and pp-228 etc. -- it is indicated.
[0005] It is AgInTe2 especially in these KARUKO pyrite mold compounds. By diluting using Sb or Bi, it is linear-velocity 7 m/s. It is known that it can be used as a record layer ingredient of the optical recording medium of order (JP,3-240590,A, a 3-99884 official report, a 3-82593 official report, a 3-73384 official report, 4-151286 official report, etc.).
[0006] It is AgSbTe2 in case a record layer crystallizes to others, JP,4-267192,A and JP,4-232779,A, and JP,6-166268,A. The phase change mold optical recording medium which a phase generates is indicated. [optical recording medium / using such a KARUKO pyrite mold compound / phase change mold]
[0007] The phase change mold optical recording medium which Japanese Patent Application No. No. 108996 [four to] for which this invention persons applied previously, 4-179267, 4-253832, 5-17968, 5-341818, and 6-87854 also achieved [optical recording medium] stabilization of the record layer in a low linear-velocity field (1.2-2.8 m/s extent) comparatively, and raised dependability by adding V, Ti, etc. to the 4 yuan system presentation which makes Ag, Sb, Te, and In a subject is proposed.
[0008] However, to perform high density image recording, it is necessary to make linear velocity quick

and to realize high-speed over-writing. The over-writing to the record layer which makes Ag, Sb, Te, and In a subject adds record power in the record mark formation section, adding bias power to a laser light source. Since bias power is weaker than record power, the amorphous section is crystallized by bias power impression and the crystalline substance section is also recrystallized, a record mark is eliminated and returns to an initial state. a record layer's corresponding to linear velocity since [it depends for the cooling rate after a laser beam exposure on the linear velocity of a medium], and in order to enable such over-writing crystal transition rate (amorphous rate at which it is, and it carries out and a microcrystal grows up to be a big and rough crystal) -- **** -- it is necessary to be What is necessary is to make the crystal transition rate of a record layer quick, for that, to increase Sb relatively and just to reduce Te relatively conversely, in order to make linear velocity quick and to perform high-speed over-writing. However, even if it uses the approach of adjusting Sb and Te, there is a limitation in high-speed over-writing, and an elimination property tends to become inadequate. And an increase and since the activation energy of a record layer will fall if it carries out and Te is reduced, a record mark becomes easy to crystallize Sb, and the dependability in the case of the preservation under hot environments will become low. For example, even if it has added V for the improvement in dependability, the linear velocity at the time of record is 4 m/s. When it is above, if saved under a 80-degree C environment, an amorphous substance-like record mark will crystallize in about 200 hours.

[0009]

[Problem(s) to be Solved by the Invention] Over-writing with high linear velocity is possible for it, and the object of this invention is offering the phase change mold optical recording medium in which sufficient dependability's is shown, even when saved under hot environments.

[0010]

[Means for Solving the Problem] Such an object is attained by either configuration of following (1) and (2).

(1) The optical recording medium which has the record layer of a phase change mold on a substrate and by which the principal component of a record layer is expressed with the following formula.

Formula {(Aa Bb Cc) 1-d Dd}1-e Ee (in the above-mentioned formula, A is Ag and/or Au, B is Sb and/or Bi, C is Te and/or Se, D is In, or is In and aluminum, and/or P, and E is at least one sort of elements chosen from Si, germanium, Sn, and Pb.) Moreover, a, b, c, d, and e express an atomic ratio, and are $0.001 \leq a \leq 0.20$, $0.40 \leq b \leq 0.90$, $0.10 \leq c \leq 0.50$, $a+b+c=1$, $0 < d \leq 0.06$, and $0.001 \leq e \leq 0.10$.

(2) The optical recording medium of the above (1) whose ratio of M in a record layer a record layer is below pentatomic % including M (M is at least one sort of elements chosen from Ti, Zr, Hf, V, Nb, Ta, Mn, W, and Mo).

[0011]

[Function and Effect] At this invention, it is ABC2. AgSbTe(s)2, such as a phase The above-mentioned element E is added in the record layer of the phase change mold which makes a phase a subject. Since a crystal transition rate improves remarkably by addition of Element E, over-writing with high linear velocity is attained. And since the activation energy of a record layer does not fall by addition of Element E, even if it faces the preservation under hot environments, dependability high enough is acquired. Therefore, the linear velocity [over-write / linear velocity] can be controlled free, maintaining high-reliability by adjusting E addition.

[0012] Moreover, since lowering of a crystallization rate is suppressed by addition of Element E although a crystal transition rate becomes slow when Element M is added for stabilization of a record mark, still higher dependability is acquired, without sacrificing the over-writing property in high linear velocity.

[0013]

[Elements of the Invention] Hereafter, the concrete configuration of this invention is explained to a detail.

[0014] The optical recording medium of this invention has the record layer of a phase change mold on a substrate. This record layer contains A (Ag and/or Au), B (Sb and/or Bi), C (Te and/or Se), D (or it is In, In and aluminum and/or P), and E (at least one sort of elements with which E is chosen from Si,

germanium, Sn, and Pb). Moreover, M (at least one sort of elements chosen from Ti, Zr, Hf, V, Nb, Ta, Mn, W, and Mo) may be contained if needed besides these.
[0015] In this record layer, record is performed so that a crystalline substance and a record mark may serve as [the non-Records Department] an amorphous substance or quality of a microcrystal.
[0016] In the non-Records Department, it is AgSbTe2 as a crystal phase. ABCs2, such as a phase It is desirable that a phase is contained. Reflection factor change of a record layer is mainly ABC2. A phase bears. Moreover, in the non-Records Department, it is ABC2. It is desirable that B phases other than a phase, such as Sb phase, are contained. A B phase is a crystal phase.
[0017] D combines with C and exists as D-C phases, such as an In-Te phase, at the non-Records Department. A D-C phase is a crystal phase which makes D and C a subject, and it is thought substantially that D:C is 1:1.
[0018] Existence of each above-mentioned phase can be checked by the transmission electron microscope, EPMA, etc.
[0019] E raises a crystal transition rate remarkably and enables over-writing with high linear velocity. It is thought that E mainly goes into B phases, such as Sb phase, and it is thought by promoting crystallization of a B phase that the crystal transition rate of the whole record layer is raised. Among E, since the effectiveness of Si and germanium is high and especially the effectiveness of Si is high, it is desirable that Si occupies especially 100 atom % more than 80 atom % of the whole E.
[0020] Since M increases the stability of an amorphous record mark, it raises the dependability of the medium under an elevated temperature and which highly humid ill condition. Especially since V is effective in especially improvement in dependability, it is desirable that V occupies 100 atom % more than 80 atom % of the whole M.
[0021] The principal component of the record layer of the optical recording medium of this invention is expressed with the following type.
[0022]
Formula {(Aa Bb Cc) 1-d Dd}1-e Ee [0023] In the above-mentioned formula, a, b, c, d, and e express an atomic ratio, and it is $0.001<=a<=0.20$, $0.40<=b<=0.90$, $0.10<=c<=0.50$, $a+b+c=1$, $0< d<=0.06$, and $0.001<=e<=0.10$. It is $0.05<=a<=0.15$, $0.50<=b<=0.80$, $0.20<=c<=0.45$, $a+b+c=1$, $0.02<=d<=0.05$, and $0.01<=e<=0.05$ preferably.
[0024] If a is too small in the above-mentioned formula, recrystallization of a record mark will become difficult and repeat over-writing will become difficult. If a is too large, the dependability of a record layer will become low. That is, when saved at an elevated temperature, crystallization of a record mark progresses, and C/N and a modulation factor become easy to deteriorate. Moreover, C/N when recording repeatedly and degradation of a modulation factor also become easy to progress.
[0025] If b is too small in the above-mentioned formula, the rate of the B phase in the non-Records Department decreases, although the reflection factor difference accompanying a phase change becomes large, a crystal transition rate will become slow rapidly and it will become difficult to eliminate it. If b is too large, the reflection factor difference accompanying a phase change will become small, and a modulation factor will become small, and a crystal transition rate will become quick too much.
[0026] It is ABC2 when c is too small in the above-mentioned formula. C for forming a phase runs short and it is ABC2. The rate of a phase will decrease. For this reason, A becomes superfluous and they are an A phase and other ABCs2. Phases other than a phase will be constituted. For this reason, A is hardly spread from a record mark to the non-Records Department at the time of record, or A is conversely spread during a record mark, and improvement in dependability is not realized, or dependability falls on the contrary. It is ABC2 when c is too large. Also after forming a phase and a D-C phase, C becomes superfluous, and C phase is formed. It becomes difficult to eliminate it, in order that C phase may reduce a crystal transition rate.
[0027] If d is too small in the above-mentioned formula, the rate of a D-C phase will decrease. A D-C phase is ABC2. In order to show the operation which checks the grain growth of a phase, reduction of a D-C phase promotes the grain growth of ABC2 phase. For this reason, amorphous-ization of a record mark will become imperfection, and a modulation factor will fall, and dependability will also become

low. It is ABC2 when d is too large. Since the grain growth of a phase is checked, elimination becomes difficult.
[0028] In the above-mentioned formula, if e is too small, improvement in a crystal transition rate will become imperfection, and the linear velocity [over-write / linear velocity] will become low. If e is too large, E will be spread so much in a B phase by the repeat of over-writing, E particle will carry out deposit separation, and BE phase will decrease. For this reason, the effectiveness by E addition is reduced and the repeat of high-speed over-writing becomes impossible.
[0029] When M is contained in addition to the above-mentioned principal component, the ratio of M in a record layer is below 3 atom % more preferably below pentatomic %. If the ratio of M is too high, the reflection factor change accompanying a phase change will become small, and enough modulation factors will no longer be obtained. M is ABC2. It is thought by checking change of the crystal structure that a crystal transition rate is reduced. For this reason, if the ratio of M is high, the effectiveness to the B phase by E will be reduced greatly relatively.
[0030] As A, it is desirable, and preferably, Ag sets more than 80 atom % to Ag more preferably, and uses only Ag still more preferably more than 50 atom % in A. If Au ratio in A is too high, a crystal transition rate will become quick too much, and it becomes difficult to secure a sufficient modulation factor and sufficient C/N.
[0031] As B, it is desirable, and preferably, Sb sets more than 80 atom % to Sb more preferably, and uses only Sb still more preferably more than 50 atom % in B. If Bi ratio in B is too high, the absorption coefficient of a record layer will increase, the cross protection of light will decrease, for this reason, the reflection factor difference between crystal-amorphous becomes small, and high [C/N] is no longer obtained.
[0032] As C, it is desirable, and preferably, Te sets more than 80 atom % to Te more preferably, and uses only Te still more preferably more than 50 atom % in C. If Se ratio in C is too high, a crystal transition rate will become slow too much, and sufficient rate of elimination will no longer be obtained.
[0033] The ratio of In in D is more than 80 atom % more preferably more than 60 atom %. Dependability will become low if In ratio in D is too low. At the time of record, in a record mark, Ag is spread around, and instead of Ag, In combines with Te and serves as an In-Te crystal. The minute crystalline nucleus of In-Te is AgSbTe2. ABCs2, such as a phase Since the minute crystalline nucleus of In-Te will decrease if there are few amounts of In(s) although the crystal growth of a phase is checked, it is ABC2. A minute crystalline nucleus joins together, it becomes easy to grow up, and the stability of a record mark becomes inadequate. In addition, the ratio of aluminum and P is arbitrary.
[0034] In addition to each above-mentioned element, in the record layer, other elements, such as Cu, nickel, Zn, Fe, O, N, and C, may be contained as minute impurities, but as for the sum total content of these elements, it is desirable that it is below 0.05 atom %.
[0035] The presentation of a record layer can be measured by the electron ray probe micro analysis (EPMA), X-ray microanalysis, etc.
[0036] In addition, the time of a crystallized state is [about 3.3 a microcrystal, or the amorphous time of the absorption coefficient k of a record layer] about 2.2.
[0037] 10-50nm of thickness of a record layer is more preferably set to 13-30nm. If a record layer is too thin, growth of a crystal phase will become difficult, and the reflection factor change accompanying a phase change serves as imperfection. On the other hand, if a record layer is too thick, since the ratio of A which A diffuses so much in the thickness direction of a record layer at the time of record mark formation, and is diffused to record stratification plane inboard at it will become small, the dependability of a record layer will become low.
[0038] Although what is necessary is not to limit especially the formation approach of a record layer, but just to choose from a spatter, vacuum deposition, etc. suitably, a spatter is usually used. When using a spatter, only an alloy target may be used and two or more sorts of plural spatters may be performed using the target which consists of a metal simple substance or an alloy. Since the record layer formed using such a target is amorphous, it needs initialization actuation before record. Initialization is performed by making it crystallize by a bulk eraser etc.

[0039] However, the crystallized record layer can be formed by dividing a spatter process into two processes or three processes. By this approach, the A-C system metal spatter process which carries out the spatter of the A-C system metal which makes A and C a subject, and B system metal spatter process which carries out the spatter of the B system metal which makes B a subject are established adjacently. And B system metal is made to contain D, or B system metal spatter process is adjoined, and D system metal spatter process which carries out the spatter of the D system metal which makes D a subject is established. What is necessary is just to make at least one sort of an A-C system metal, B system metal, and D system metal contain E and M. The detail of this approach is indicated by the application on February 13, Heisei 7 by the applicant for this patent (reference number 07P007).
[0040] The example of a configuration of the optical recording medium of this invention is shown in drawing 1 . In this drawing, an optical recording medium 1 has the lower dielectric layer 3, the record layer 4, the up dielectric layer 5, a reflecting layer 6, and a protective layer 7 on a substrate 2.
[0041] Since a light beam is irradiated by the record layer 4 through a substrate 2 in the optical recording medium of this configuration, as for a substrate 2, it is desirable to consist of transparent construction material, for example, resin, glass, etc., substantially to the light beam to be used. Handling is easy, and since it is cheap, as construction material of a substrate, resin is [among these] desirable. What is necessary is just to specifically use various resin, such as acrylic resin, a polycarbonate, an epoxy resin, and polyolefine. Although especially the configuration and dimension of a substrate are not limited, it is a disk-like, and thickness is about 0.5-3mm, and a diameter is usually about 50-360mm. Predetermined patterns, such as a groove, are prepared in the front face of a substrate if needed a sake [the object for tracking, for the addresses, etc.].
[0042] The lower dielectric layer 3 intercepts the heat which prevents oxidation of a record layer and is transmitted from a record layer to a substrate at the time of record, and protects a substrate. The up dielectric layer 5 is formed after record in order to emit the heat which remained in the record layer by heat conduction, while protecting a record layer. especially the dielectric used for each dielectric layer is limited -- not having -- for example, SiO2 etc. -- silicon oxide and Si3 N4 etc. -- various glass etc. may be used that what is necessary is just to use various transparent ceramics, such as zinc sulfide, such as silicon nitride and ZnS, or such mixture. Moreover, for example, the so-called LaSiON containing La, Si, O, and N, the so-called SiAlON containing Si, aluminum, O, and N or SiAlON containing Y, etc. can be used preferably. In these, that whose refractive index in the range of 400-850nm wavelength is 1.4 or more, for example is desirable, and that especially whose refractive index is 1.8 or more desirable. In addition, the above-mentioned wavelength range is wavelength range preferably used to the optical recording medium of this invention including 780nm which is the operating wavelength of a current CD player, and 680nm to which utilization is advanced as next-generation record wavelength. The dielectric materials to be used are specifically Si3 N4, and ZnS and SiO2. Mixture, and ZnS and Si3 N4 Mixture, and ZnS and Ta 2O5 Mixture etc. is desirable. 50-300nm of thickness of the lower dielectric layer 3 is more preferably set to 100-250nm. By making a lower dielectric layer into such thickness, the substrate breakage on for record can be prevented effectively, and, moreover, a modulation factor also becomes high. Thickness of the up dielectric layer 5 is preferably set to 10-60nm. Since a cooling rate becomes quick by making an up dielectric layer into such thickness, the edge of a record mark becomes clear and a jitter becomes low. Moreover, a modulation factor can be made high by considering as such thickness.
[0043] In addition, the lower dielectric layer 3 and/or the up dielectric layer 5 may consist of dielectric layers more than two-layer [from which a presentation differs] so that it may mention later, for example.
[0044] As for each dielectric layer, it is desirable to form by vapor growth, such as a spatter and vacuum deposition.
[0045] What is necessary is just to usually consist of high reflection factor metals, such as an alloy containing simple substances, such as aluminum, Au, Ag, Pt, and Cu, or these one or more sorts, although especially the construction material of a reflecting layer 6 is not limited. As for the thickness of a reflecting layer, it is desirable to be referred to as 30-150nm. It is hard coming to obtain sufficient reflection factor with thickness being said under range. Moreover, even if it exceeds said range, the

improvement in a reflection factor is small and becomes disadvantageous in cost. As for a reflecting layer, it is desirable to form by vapor growth, such as a spatter and vacuum deposition.
[0046] A protective layer 7 is formed for improvement in abrasion-proof nature or corrosion resistance. Although it is desirable to consist of matter of various organic systems as for this protective layer, it is desirable to consist of matter which stiffened a radiation-curing mold compound and its constituent with radiations, such as an electron ray and ultraviolet rays, especially. Protection layer thickness is usually 0.1-100 micrometers. What is necessary is to be extent and just to form a spin coat, gravure spreading, a spray coat, dipping, etc. by the usual approach.
[0047] In addition, in order to make the reflection factor from a medium high, it is good also as a configuration in which the higher dielectric layer of a refractive index exists in a substrate side in said layered product including at least one layered product which a lower dielectric layer becomes from the two-layer dielectric layer in which a refractive index is different from each other. With this configuration, a laminating is usually carried out to the order of a high refractive-index layer, a low refractive-index layer, a record layer, an up dielectric layer, a reflecting layer, and a protective layer on a substrate.
[0048] In the optical recording medium of this invention, record and playback are performed as follows.
[0049] As for the optical recording medium of this invention, a record layer is initialized after manufacture if needed (crystallization). An exposure part is fused by irradiating the light beam for record (laser beam beam) at the record layer of a crystallization condition. and -- since the temperature of said part falls quickly after the light beam passage for record -- said part -- substantial -- amorphous-izing -- or it microcrystal-izes and becomes a record mark.
[0050] On the other hand, when rewriting recording information, the light beam for record is irradiated by the part newly considered as a record mark, and the light beam for elimination is continuously irradiated by other parts. Although the temperature of the exposure part of the light beam for elimination rises, since the light beam for elimination is low power compared with the light beam for record, attainment temperature is temperature which does not exceed the melting point of a record layer low relatively. However, since the exposure field of the light beam for elimination is large, a temperature gradient becomes gently-sloping according to the accumulation effectiveness, a cooling rate becomes slower than the above-mentioned crystal transition rate, and a crystalline substance is formed. Although a record mark is once fused by the exposure of the light beam for record, since the heat at this time is quickly diffused in the direction of a reflecting layer, it can maintain an amorphous substance thru/or a microcrystal condition. Therefore, in the case of rewriting, even if the condition before an exposure is a crystalline substance and it is an amorphous substance thru/or a microcrystal, all the light beam exposure parts for record serve as a record mark of an amorphous substance thru/or a microcrystal, and all the light beam exposure parts for elimination serve as a crystalline substance, and the over-writing record of them is attained. In addition, in such over-writing record, it is possible by modulating a single light beam to irradiate the light beam for record and the light beam for elimination. That is, bias power is added to the laser light source, and record power is added in the record mark formation section.
[0051] As for the light beam for record, irradiating in the shape of a pulse is desirable. Since the accumulation in a record mark is controlled and bulging (teardrop phenomenon) of the record mark back end section can be stopped by recording one signal by at least two exposures, C/N improves. Moreover, the rate of elimination also improves by pulse-like exposure.
[0052] The concrete value of the power of the light beam for record and the power of the light beam for elimination can be determined experimentally.
[0053] The light beam for playback is a light beam of the low power which does not affect the crystallized state of a record layer.
[0054] In addition, compared with the non-Records Department of a crystalline substance, as for the amorphous record mark which is, carries out and consists of quality of a microcrystal, a reflection factor becomes low.
[0055] the relative velocity (phase twisted-pair-line rate) of a record layer [as opposed to the light beam for record on the occasion of record to the optical recording medium of this invention] -- usually -- 1 -

30 m/s although it is extent -- desirable -- 4 - 25 m/s -- more -- desirable -- 6 - 20 m/s -- further -- desirable -- 10 - 20 m/s it is . In the optical recording medium of this invention, over-writing in such a high linear-velocity field is possible, and, moreover, sufficient dependability is acquired.
[0056]
[Example] Hereafter, the concrete example of this invention is shown and this invention is further explained to a detail.
[0057] A lower dielectric layer, the record layer, the up dielectric layer, the reflecting layer, and the protective layer were formed in the front face of a disk-like polycarbonate substrate with a diameter [of 133mm] which carried out simultaneous formation of the groove with <example 1> injection molding, and a thickness of 1.2mm, and it considered as optical recording DISUKUSAMPURU which has the configuration of drawing 1 .
[0058] A lower dielectric layer is ZnS and SiO2. It considered as the target and formed by the spatter. SiO2/(ZnS+SiO2) could be 15-mol %. Lower dielectric layer thickness could be 120nm.
[0059] The record layer was formed by RF spatter. What stuck each chip of Ag, In, Te, and Si on the front face of Sb target was used for the spatter target. Thickness of a record layer was set to 25nm. When the presentation of a record layer was measured by ICP, in {(Aga Sbb Tec) 1-d Ind}1-e Sie, it was a= 0.123, b= 0.544, c= 0.333, d= 0.05, and e= 0.017.
[0060] The up dielectric layer was formed like the lower dielectric layer. Up dielectric layer thickness could be 22nm.
[0061] The reflecting layer used aluminum-nickel for the target, and formed it by the spatter, and thickness was set to 100nm.
[0062] With the spin coat method, after spreading, the protective layer hardened ultraviolet curing mold resin by UV irradiation, and formed it. the protective layer thickness after hardening -- 5 micrometers it was .
[0063] The record layer of this sample was initialized by the bulk eraser. A crystalline substance is AgSbTe2 when the record layer after initialization was analyzed by the transmission electron microscope, EPMA, and X-ray microanalysis. It was the mixed phase of a phase, Sb phase, a SbSi phase, and an InTe phase.
[0064] Subsequently, record power is set to 12mW, bias power is set to 6mW, and it is 3.38MHz. The signal and the highest (25 dB the above elimination is possible) linear velocity [over-write / linear velocity] was investigated. [repeated and] consequently, the highest linear velocity [over-write / linear velocity / this sample] -- 12 m/s it was .
[0065] Next, it is linear-velocity 12 m/s to this sample. 3.38MHz The signal was recorded and C/N of that regenerative signal was measured. In addition, wavelength of a laser beam was set to 680nm. And it saved under the conditions of 80 degree C and 80%RH after record, and the dependability of a record layer was investigated. Consequently, with this sample, degradation of C/N was not accepted over 5000 hours or more.
[0066] The presentation of the <example 1 of comparison> record layer was set to 1(Aga Sbb Tec)-d Ind (a, b, c, and d are the same as that of an example 1), and the comparison sample was produced like the example 1 except this. The record layer of this comparison sample removes Si from the record layer of the sample of an example 1. the place which asked for the highest linear velocity [over-write / linear velocity] about this comparison sample as well as an example 1 -- 2.8 m/s it was . The comparison with the example 1 of a comparison and an example 1 shows that the linear velocity [over-write / linear velocity / only by adding Si, without changing the ratio of Ag, Sb, Te, and In of the main presentation] becomes remarkably high, and high-reliability is moreover acquired.
[0067] The presentation of the <example 2 of comparison> record layer was set to {(Aga Sbb Tec) 1-d Ind}1-e Ve (a, b, c, d, and e are the same as that of an example 1), and the comparison sample was produced like the example 1 except this. The record layer of this comparison sample changes Si of the record layer of the sample of an example 1 to V. the place which asked for the highest linear velocity [over-write / linear velocity] about this comparison sample as well as an example 1 -- 1.4 m/s it was .
[0068] In addition, even when a part of Si [at least] of the record layer of the sample of an example 1

was changed to at least one sort of germanium, Sn, and Pb, it was admitted that the highest linear velocity [over-write / linear velocity] improved.
[0069] Moreover, in the sample produced in the example 1, when a part of Sb [at least] of a record layer was changed to Bi, a part of Ag [at least] was changed to Au and a part of Te [at least] was changed to Se, the effectiveness of Si addition was acquired also in any at the time of changing a part of In to aluminum and/or P. However, if the amount of Bi permutations exceeds 80 atom % of Sb, the absorption coefficient of a record layer would become high, the reflection factor difference between crystal [which can be taken optically]-amorphous would become small, and modulation factors will have decreased in number.
[0070] Moreover, although the highest linear velocity [over-write / linear velocity] fell a little when V was added in the record layer of the sample of an example 1 so that content might become 0.5 atom %, improvement in dependability was accepted.
[0071] The effectiveness of this invention is clear from the above result.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Industrial Application] This invention relates to the optical recording medium which records information using change of the crystallized state of the record layer by light beam exposure.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] In recent years, the optical recording medium [high density record is possible and] which can moreover eliminate and rewrite recording information attracts attention. Among the optical recording media of a rewritable mold, by irradiating laser light, the optical recording medium of a phase change mold changes the crystallized state of a record layer, and detects reflection factor change of the record layer accompanying such a change of state. Over-writing by the single light beam is possible for the optical recording medium of a phase change mold, and since it is simple compared with it of a magneto-optic-recording medium, the optical system of a driving gear attracts attention.
[0003] Although a germanium-Te system ingredient is used for it by the crystallized state and the amorphous state in many cases since the stability of that the difference of a reflection factor is large and an amorphous state is comparatively high to the optical recording medium of a phase change mold, applying the compound called KARUKO pyrite recently is proposed.
[0004] A KARUKO pyrite mold compound is widely studied as a compound semiconductor ingredient, and is applied to the solar battery etc. A KARUKO pyrite mold compound is Ib-IIIb-VIb2 and IIb-IVb-Vb2, when the chemistry periodic table is used. It is the presentation expressed and has the structure which accumulated two diamond structures. a KARUKO pyrite mold compound -- X-ray structural analysis -- easy -- structure -- it can determine -- the fundamental property -- for example, monthly FIJIKUSU vol.8 and No. -- 8, 1987, pp-441, electrochemistry vol.56, and No. -- 4, 1988, and pp-228 etc. -- it is indicated.
[0005] It is AgInTe2 especially in these KARUKO pyrite mold compounds. By diluting using Sb or Bi, it is linear-velocity 7 m/s. It is known that it can be used as a record layer ingredient of the optical recording medium of order (JP,3-240590,A, a 3-99884 official report, a 3-82593 official report, a 3-73384 official report, 4-151286 official report, etc.).
[0006] It is AgSbTe2 in case a record layer crystallizes to others, JP,4-267192,A and JP,4-232779,A, and JP,6-166268,A. The phase change mold optical recording medium which a phase generates is indicated. [optical recording medium / using such a KARUKO pyrite mold compound / phase change mold]
[0007] The phase change mold optical recording medium which Japanese Patent Application No. No. 108996 [four to] for which this invention persons applied previously, 4-179267, 4-253832, 5-17968, 5-341818, and 6-87854 also achieved [optical recording medium] stabilization of the record layer in a low linear-velocity field (1.2-2.8 m/s extent) comparatively, and raised dependability by adding V, Ti, etc. to the 4 yuan system presentation which makes Ag, Sb, Te, and In a subject is proposed.
[0008] However, to perform high density image recording, it is necessary to make linear velocity quick and to realize high-speed over-writing. The over-writing to the record layer which makes Ag, Sb, Te, and In a subject adds record power in the record mark formation section, adding bias power to a laser light source. Since bias power is weaker than record power, the amorphous section is crystallized by bias power impression and the crystalline substance section is also recrystallized, a record mark is eliminated and returns to an initial state. a record layer's corresponding to linear velocity since [it depends for the

cooling rate after a laser beam exposure on the linear velocity of a medium], and in order to enable such over-writing crystal transition rate (amorphous rate at which it is, and it carries out and a microcrystal grows up to be a big and rough crystal) -- **** -- it is necessary to be What is necessary is to make the crystal transition rate of a record layer quick, for that, to increase Sb relatively and just to reduce Te relatively conversely, in order to make linear velocity quick and to perform high-speed over-writing. However, even if it uses the approach of adjusting Sb and Te, there is a limitation in high-speed over-writing, and an elimination property tends to become inadequate. And an increase and since the activation energy of a record layer will fall if it carries out and Te is reduced, a record mark becomes easy to crystallize Sb, and the dependability in the case of the preservation under hot environments will become low. For example, even if it has added V for the improvement in dependability, the linear velocity at the time of record is 4 m/s. When it is above, if saved under a 80-degree C environment, an amorphous substance-like record mark will crystallize in about 200 hours.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[Function and Effect] At this invention, it is ABC2. AgSbTe(s)2, such as a phase The above-mentioned element E is added in the record layer of the phase change mold which makes a phase a subject. Since a crystal transition rate improves remarkably by addition of Element E, over-writing with high linear velocity is attained. And since the activation energy of a record layer does not fall by addition of Element E, even if it faces the preservation under hot environments, dependability high enough is acquired. Therefore, the linear velocity [over-write / linear velocity] can be controlled free, maintaining high-reliability by adjusting E addition.
[0012] Moreover, since lowering of a crystallization rate is suppressed by addition of Element E although a crystal transition rate becomes slow when Element M is added for stabilization of a record mark, still higher dependability is acquired, without sacrificing the over-writing property in high linear velocity.
[0013]
[Elements of the Invention] Hereafter, the concrete configuration of this invention is explained to a detail.
[0014] The optical recording medium of this invention has the record layer of a phase change mold on a substrate. This record layer contains A (Ag and/or Au), B (Sb and/or Bi), C (Te and/or Se), D (or it is In, In and aluminum and/or P), and E (at least one sort of elements with which E is chosen from Si, germanium, Sn, and Pb). Moreover, M (at least one sort of elements chosen from Ti, Zr, Hf, V, Nb, Ta, Mn, W, and Mo) may be contained if needed besides these.
[0015] In this record layer, record is performed so that a crystalline substance and a record mark may serve as [the non-Records Department] an amorphous substance or quality of a microcrystal.
[0016] In the non-Records Department, it is AgSbTe2 as a crystal phase. ABCs2, such as a phase It is desirable that a phase is contained. Reflection factor change of a record layer is mainly ABC2. A phase bears. Moreover, in the non-Records Department, it is ABC2. It is desirable that B phases other than a phase, such as Sb phase, are contained. A B phase is a crystal phase.
[0017] D combines with C and exists as D-C phases, such as an In-Te phase, at the non-Records Department. A D-C phase is a crystal phase which makes D and C a subject, and it is thought substantially that D:C is 1:1.
[0018] Existence of each above-mentioned phase can be checked by the transmission electron microscope, EPMA, etc.
[0019] E raises a crystal transition rate remarkably and enables over-writing with high linear velocity. It is thought that E mainly goes into B phases, such as Sb phase, and it is thought by promoting crystallization of a B phase that the crystal transition rate of the whole record layer is raised. Among E, since the effectiveness of Si and germanium is high and especially the effectiveness of Si is high, it is desirable that Si occupies especially 100 atom % more than 80 atom % of the whole E.
[0020] Since M increases the stability of an amorphous record mark, it raises the dependability of the medium under an elevated temperature and which highly humid ill condition. Especially since V is effective in especially improvement in dependability, it is desirable that V occupies 100 atom % more

than 80 atom % of the whole M.
[0021] The principal component of the record layer of the optical recording medium of this invention is expressed with the following type.
[0022]
Formula {(Aa Bb Cc) 1-d Dd}1-e Ee [0023] In the above-mentioned formula, a, b, c, d, and e express an atomic ratio, and it is 0.001<=a<=0.20, 0.40<=b<=0.90, 0.10<=c<=0.50, a+b+c=1, 0< d<=0.06, and 0.001<=e<=0.10. It is 0.05<=a<=0.15, 0.50<=b<=0.80, 0.20<=c<=0.45, a+b+c=1, 0.02<=d<=0.05, and 0.01<=e<=0.05 preferably.
[0024] If a is too small in the above-mentioned formula, recrystallization of a record mark will become difficult and repeat over-writing will become difficult. If a is too large, the dependability of a record layer will become low. That is, when saved at an elevated temperature, crystallization of a record mark progresses, and C/N and a modulation factor become easy to deteriorate. Moreover, C/N when recording repeatedly and degradation of a modulation factor also become easy to progress.
[0025] If b is too small in the above-mentioned formula, the rate of the B phase in the non-Records Department decreases, although the reflection factor difference accompanying a phase change becomes large, a crystal transition rate will become slow rapidly and it will become difficult to eliminate it. If b is too large, the reflection factor difference accompanying a phase change will become small, and a modulation factor will become small, and a crystal transition rate will become quick too much.
[0026] It is ABC2 when c is too small in the above-mentioned formula. C for forming a phase runs short and it is ABC2. The rate of a phase will decrease. For this reason, A becomes superfluous and they are an A phase and other ABCs2. Phases other than a phase will be constituted. For this reason, A is hardly spread from a record mark to the non-Records Department at the time of record, or A is conversely spread during a record mark, and improvement in dependability is not realized, or dependability falls on the contrary. It is ABC2 when c is too large. Also after forming a phase and a D-C phase, C becomes superfluous, and C phase is formed. It becomes difficult to eliminate it, in order that C phase may reduce a crystal transition rate.
[0027] If d is too small in the above-mentioned formula, the rate of a D-C phase will decrease. A D-C phase is ABC2. In order to show the operation which checks the grain growth of a phase, reduction of a D-C phase promotes the grain growth of ABC2 phase. For this reason, amorphous-ization of a record mark will become imperfection, and a modulation factor will fall, and dependability will also become low. It is ABC2 when d is too large. Since the grain growth of a phase is checked, elimination becomes difficult.
[0028] In the above-mentioned formula, if e is too small, improvement in a crystal transition rate will become imperfection, and the linear velocity [over-write / linear velocity] will become low. If e is too large, E will be spread so much in a B phase by the repeat of over-writing, E particle will carry out deposit separation, and BE phase will decrease. For this reason, the effectiveness by E addition is reduced and the repeat of high-speed over-writing becomes impossible.
[0029] When M is contained in addition to the above-mentioned principal component, the ratio of M in a record layer is below 3 atom % more preferably below pentatomic %. If the ratio of M is too high, the reflection factor change accompanying a phase change will become small, and enough modulation factors will no longer be obtained. M is ABC2. It is thought by checking change of the crystal structure that a crystal transition rate is reduced. For this reason, if the ratio of M is high, the effectiveness to the B phase by E will be reduced greatly relatively.
[0030] As A, it is desirable, and preferably, Ag sets more than 80 atom % to Ag more preferably, and uses only Ag still more preferably more than 50 atom % in A. If Au ratio in A is too high, a crystal transition rate will become quick too much, and it becomes difficult to secure a sufficient modulation factor and sufficient C/N.
[0031] As B, it is desirable, and preferably, Sb sets more than 80 atom % to Sb more preferably, and uses only Sb still more preferably more than 50 atom % in B. If Bi ratio in B is too high, the absorption coefficient of a record layer will increase, the cross protection of light will decrease, for this reason, the reflection factor difference between crystal-amorphous becomes small, and high [C/N] is no longer

obtained.
[0032] As C, it is desirable, and preferably, Te sets more than 80 atom % to Te more preferably, and uses only Te still more preferably more than 50 atom % in C. If Se ratio in C is too high, a crystal transition rate will become slow too much, and sufficient rate of elimination will no longer be obtained.
[0033] The ratio of In in D is more than 80 atom % more preferably more than 60 atom %. Dependability will become low if In ratio in D is too low. At the time of record, in a record mark, Ag is spread around, and instead of Ag, In combines with Te and serves as an In-Te crystal. The minute crystalline nucleus of In-Te is AgSbTe2. ABCs2, such as a phase Since the minute crystalline nucleus of In-Te will decrease if there are few amounts of In(s) although the crystal growth of a phase is checked, it is ABC2. A minute crystalline nucleus joins together, it becomes easy to grow up, and the stability of a record mark becomes inadequate. In addition, the ratio of aluminum and P is arbitrary.
[0034] In addition to each above-mentioned element, in the record layer, other elements, such as Cu, nickel, Zn, Fe, O, N, and C, may be contained as minute impurities, but as for the sum total content of these elements, it is desirable that it is below 0.05 atom %.
[0035] The presentation of a record layer can be measured by the electron ray probe micro analysis (EPMA), X-ray microanalysis, etc.
[0036] In addition, the time of a crystallized state is [about 3.3 a microcrystal, or the amorphous time of the absorption coefficient k of a record layer] about 2.2.
[0037] 10-50nm of thickness of a record layer is more preferably set to 13-30nm. If a record layer is too thin, growth of a crystal phase will become difficult, and the reflection factor change accompanying a phase change serves as imperfection. On the other hand, if a record layer is too thick, since the ratio of A which A diffuses so much in the thickness direction of a record layer at the time of record mark formation, and is diffused to record stratification plane inboard at it will become small, the dependability of a record layer will become low.
[0038] Although what is necessary is not to limit especially the formation approach of a record layer, but just to choose from a spatter, vacuum deposition, etc. suitably, a spatter is usually used. When using a spatter, only an alloy target may be used and two or more sorts of plural spatters may be performed using the target which consists of a metal simple substance or an alloy. Since the record layer formed using such a target is amorphous, it needs initialization actuation before record. Initialization is performed by making it crystallize by a bulk eraser etc.
[0039] However, the crystallized record layer can be formed by dividing a spatter process into two processes or three processes. By this approach, the A-C system metal spatter process which carries out the spatter of the A-C system metal which makes A and C a subject, and B system metal spatter process which carries out the spatter of the B system metal which makes B a subject are established adjacently. And B system metal is made to contain D, or B system metal spatter process is adjoined, and D system metal spatter process which carries out the spatter of the D system metal which makes D a subject is established. What is necessary is just to make at least one sort of an A-C system metal, B system metal, and D system metal contain E and M. The detail of this approach is indicated by the application on February 13, Heisei 7 by the applicant for this patent (reference number 07P007).
[0040] The example of a configuration of the optical recording medium of this invention is shown in drawing 1 . In this drawing, an optical recording medium 1 has the lower dielectric layer 3, the record layer 4, the up dielectric layer 5, a reflecting layer 6, and a protective layer 7 on a substrate 2.
[0041] Since a light beam is irradiated by the record layer 4 through a substrate 2 in the optical recording medium of this configuration, as for a substrate 2, it is desirable to consist of transparent construction material, for example, resin, glass, etc., substantially to the light beam to be used. Handling is easy, and since it is cheap, as construction material of a substrate, resin is [among these] desirable. What is necessary is just to specifically use various resin, such as acrylic resin, a polycarbonate, an epoxy resin, and polyolefine. Although especially the configuration and dimension of a substrate are not limited, it is a disk-like, and thickness is about 0.5-3mm, and a diameter is usually about 50-360mm. Predetermined patterns, such as a groove, are prepared in the front face of a substrate if needed a sake [the object for tracking, for the addresses, etc.].

[0042] The lower dielectric layer 3 intercepts the heat which prevents oxidation of a record layer and is transmitted from a record layer to a substrate at the time of record, and protects a substrate. The up dielectric layer 5 is formed after record in order to emit the heat which remained in the record layer by heat conduction, while protecting a record layer. especially the dielectric used for each dielectric layer is limited -- not having -- for example, SiO2 etc. -- silicon oxide and Si3 N4 etc. -- various glass etc. may be used that what is necessary is just to use various transparent ceramics, such as zinc sulfide, such as silicon nitride and ZnS, or such mixture. Moreover, for example, the so-called LaSiON containing La, Si, O, and N, the so-called SiAlON containing Si, aluminum, O, and N or SiAlON containing Y, etc. can be used preferably. In these, that whose refractive index in the range of 400-850nm wavelength is 1.4 or more, for example is desirable, and that especially whose refractive index is 1.8 or more desirable. In addition, the above-mentioned wavelength range is wavelength range preferably used to the optical recording medium of this invention including 780nm which is the operating wavelength of a current CD player, and 680nm to which utilization is advanced as next-generation record wavelength. The dielectric materials to be used are specifically Si3 N4, and ZnS and SiO2. Mixture, and ZnS and Si3 N4 Mixture, and ZnS and Ta 2O5 Mixture etc. is desirable. 50-300nm of thickness of the lower dielectric layer 3 is more preferably set to 100-250nm. By making a lower dielectric layer into such thickness, the substrate breakage on for record can be prevented effectively, and, moreover, a modulation factor also becomes high. Thickness of the up dielectric layer 5 is preferably set to 10-60nm. Since a cooling rate becomes quick by making an up dielectric layer into such thickness, the edge of a record mark becomes clear and a jitter becomes low. Moreover, a modulation factor can be made high by considering as such thickness.
[0043] In addition, the lower dielectric layer 3 and/or the up dielectric layer 5 may consist of dielectric layers more than two-layer [from which a presentation differs] so that it may mention later, for example.
[0044] As for each dielectric layer, it is desirable to form by vapor growth, such as a spatter and vacuum deposition.
[0045] What is necessary is just to usually consist of high reflection factor metals, such as an alloy containing simple substances, such as aluminum, Au, Ag, Pt, and Cu, or these one or more sorts, although especially the construction material of a reflecting layer 6 is not limited. As for the thickness of a reflecting layer, it is desirable to be referred to as 30-150nm. It is hard coming to obtain sufficient reflection factor with thickness being said under range. Moreover, even if it exceeds said range, the improvement in a reflection factor is small and becomes disadvantageous in cost. As for a reflecting layer, it is desirable to form by vapor growth, such as a spatter and vacuum deposition.
[0046] A protective layer 7 is formed for improvement in abrasion-proof nature or corrosion resistance. Although it is desirable to consist of matter of various organic systems as for this protective layer, it is desirable to consist of matter which stiffened a radiation-curing mold compound and its constituent with radiations, such as an electron ray and ultraviolet rays, especially. Protection layer thickness is usually 0.1-100 micrometers. What is necessary is to be extent and just to form a spin coat, gravure spreading, a spray coat, dipping, etc. by the usual approach.
[0047] In addition, in order to make the reflection factor from a medium high, it is good also as a configuration in which the higher dielectric layer of a refractive index exists in a substrate side in said layered product including at least one layered product which a lower dielectric layer becomes from the two-layer dielectric layer in which a refractive index is different from each other. With this configuration, a laminating is usually carried out to the order of a high refractive-index layer, a low refractive-index layer, a record layer, an up dielectric layer, a reflecting layer, and a protective layer on a substrate.
[0048] In the optical recording medium of this invention, record and playback are performed as follows.
[0049] As for the optical recording medium of this invention, a record layer is initialized after manufacture if needed (crystallization). An exposure part is fused by irradiating the light beam for record (laser beam beam) at the record layer of a crystallization condition. and -- since the temperature of said part falls quickly after the light beam passage for record -- said part -- substantial -- amorphous-izing -- or it microcrystal-izes and becomes a record mark.

[0050] On the other hand, when rewriting recording information, the light beam for record is irradiated by the part newly considered as a record mark, and the light beam for elimination is continuously irradiated by other parts. Although the temperature of the exposure part of the light beam for elimination rises, since the light beam for elimination is low power compared with the light beam for record, attainment temperature is temperature which does not exceed the melting point of a record layer low relatively. However, since the exposure field of the light beam for elimination is large, a temperature gradient becomes gently-sloping according to the accumulation effectiveness, a cooling rate becomes slower than the above-mentioned crystal transition rate, and a crystalline substance is formed. Although a record mark is once fused by the exposure of the light beam for record, since the heat at this time is quickly diffused in the direction of a reflecting layer, it can maintain an amorphous substance thru/or a microcrystal condition. Therefore, in the case of rewriting, even if the condition before an exposure is a crystalline substance and it is an amorphous substance thru/or a microcrystal, all the light beam exposure parts for record serve as a record mark of an amorphous substance thru/or a microcrystal, and all the light beam exposure parts for elimination serve as a crystalline substance, and the over-writing record of them is attained. In addition, in such over-writing record, it is possible by modulating a single light beam to irradiate the light beam for record and the light beam for elimination. That is, bias power is added to the laser light source, and record power is added in the record mark formation section.
[0051] As for the light beam for record, irradiating in the shape of a pulse is desirable. Since the accumulation in a record mark is controlled and bulging (teardrop phenomenon) of the record mark back end section can be stopped by recording one signal by at least two exposures, C/N improves. Moreover, the rate of elimination also improves by pulse-like exposure.
[0052] The concrete value of the power of the light beam for record and the power of the light beam for elimination can be determined experimentally.
[0053] The light beam for playback is a light beam of the low power which does not affect the crystallized state of a record layer.
[0054] In addition, compared with the non-Records Department of a crystalline substance, as for the amorphous record mark which is, carries out and consists of quality of a microcrystal, a reflection factor becomes low.
[0055] the relative velocity (phase twisted-pair-line rate) of a record layer [as opposed to the light beam for record on the occasion of record to the optical recording medium of this invention] -- usually -- 1 - 30 m/s although it is extent -- desirable -- 4 - 25 m/s -- more -- desirable -- 6 - 20 m/s -- further -- desirable -- 10 - 20 m/s it is . In the optical recording medium of this invention, over-writing in such a high linear-velocity field is possible, and, moreover, sufficient dependability is acquired.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Over-writing with high linear velocity is possible for it, and the object of this invention is offering the phase change mold optical recording medium in which sufficient dependability's is shown, even when saved under hot environments.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem] Such an object is attained by either configuration of following (1) and (2).
(1) The optical recording medium which has the record layer of a phase change mold on a substrate and by which the principal component of a record layer is expressed with the following formula.
Formula {(Aa Bb Cc) 1-d Dd}1-e Ee (in the above-mentioned formula, A is Ag and/or Au, B is Sb and/or Bi, C is Te and/or Se, D is In, or is In and aluminum, and/or P, and E is at least one sort of elements chosen from Si, germanium, Sn, and Pb.) Moreover, a, b, c, d, and e express an atomic ratio, and are 0.001<=a<=0.20, 0.40<=b<=0.90, 0.10<=c<=0.50, a+b+c=1, 0< d<=0.06, and 0.001<=e<=0.10.
(2) The optical recording medium of the above (1) whose ratio of M in a record layer a record layer is below pentatomic % including M (M is at least one sort of elements chosen from Ti, Zr, Hf, V, Nb, Ta, Mn, W, and Mo).

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EXAMPLE

[Example] Hereafter, the concrete example of this invention is shown and this invention is further explained to a detail.
[0057] A lower dielectric layer, the record layer, the up dielectric layer, the reflecting layer, and the protective layer were formed in the front face of a disk-like polycarbonate substrate with a diameter [of 133mm] which carried out simultaneous formation of the groove with <example 1> injection molding, and a thickness of 1.2mm, and it considered as optical recording DISUKUSAMPURU which has the configuration of drawing 1 .
[0058] A lower dielectric layer is ZnS and SiO2. It considered as the target and formed by the spatter. SiO2/(ZnS+SiO2) could be 15-mol %. Lower dielectric layer thickness could be 120nm.
[0059] The record layer was formed by RF spatter. What stuck each chip of Ag, In, Te, and Si on the front face of Sb target was used for the spatter target. Thickness of a record layer was set to 25nm. When the presentation of a record layer was measured by ICP, in {(Aga Sbb Tec) 1-d Ind}1-e Sie, it was a= 0.123, b= 0.544, c= 0.333, d= 0.05, and e= 0.017.
[0060] The up dielectric layer was formed like the lower dielectric layer. Up dielectric layer thickness could be 22nm.
[0061] The reflecting layer used aluminum-nickel for the target, and formed it by the spatter, and thickness was set to 100nm.
[0062] With the spin coat method, after spreading, the protective layer hardened ultraviolet curing mold resin by UV irradiation, and formed it. the protective layer thickness after hardening -- 5 micrometers it was .
[0063] The record layer of this sample was initialized by the bulk eraser. A crystalline substance is AgSbTe2 when the record layer after initialization was analyzed by the transmission electron microscope, EPMA, and X-ray microanalysis. It was the mixed phase of a phase, Sb phase, a SbSi phase, and an InTe phase.
[0064] Subsequently, record power is set to 12mW, bias power is set to 6mW, and it is 3.38MHz. The signal and the highest (25 dB the above elimination is possible) linear velocity [over-write / linear velocity] was investigated. [repeated and] consequently, the highest linear velocity [over-write / linear velocity / this sample] -- 12 m/s it was .
[0065] Next, it is linear-velocity 12 m/s to this sample. 3.38MHz The signal was recorded and C/N of that regenerative signal was measured. In addition, wavelength of a laser beam was set to 680nm. And it saved under the conditions of 80 degree C and 80%RH after record, and the dependability of a record layer was investigated. Consequently, with this sample, degradation of C/N was not accepted over 5000 hours or more.
[0066] The presentation of the <example 1 of comparison> record layer was set to 1(Aga Sbb Tec)-d Ind (a, b, c, and d are the same as that of an example 1), and the comparison sample was produced like the example 1 except this. The record layer of this comparison sample removes Si from the record layer of the sample of an example 1. the place which asked for the highest linear velocity [over-write / linear velocity] about this comparison sample as well as an example 1 -- 2.8 m/s it was . The comparison with

the example 1 of a comparison and an example 1 shows that the linear velocity [over-write / linear velocity / only by adding Si, without changing the ratio of Ag, Sb, Te, and In of the main presentation] becomes remarkably high, and high-reliability is moreover acquired.

[0067] The presentation of the <example 2 of comparison> record layer was set to {(Aga Sbb Tec) 1-d Ind}1-e Ve (a, b, c, d, and e are the same as that of an example 1), and the comparison sample was produced like the example 1 except this. The record layer of this comparison sample changes Si of the record layer of the sample of an example 1 to V. the place which asked for the highest linear velocity [over-write / linear velocity] about this comparison sample as well as an example 1 -- 1.4 m/s it was .

[0068] In addition, even when a part of Si [at least] of the record layer of the sample of an example 1 was changed to at least one sort of germanium, Sn, and Pb, it was admitted that the highest linear velocity [over-write / linear velocity] improved.

[0069] Moreover, in the sample produced in the example 1, when a part of Sb [at least] of a record layer was changed to Bi, a part of Ag [at least] was changed to Au and a part of Te [at least] was changed to Se, the effectiveness of Si addition was acquired also in any at the time of changing a part of In to aluminum and/or P. However, if the amount of Bi permutations exceeds 80 atom % of Sb, the absorption coefficient of a record layer would become high, the reflection factor difference between crystal [which can be taken optically]-amorphous would become small, and modulation factors will have decreased in number.

[0070] Moreover, although the highest linear velocity [over-write / linear velocity] fell a little when V was added in the record layer of the sample of an example 1 so that content might become 0.5 atom %, improvement in dependability was accepted.

[0071] The effectiveness of this invention is clear from the above result.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the fragmentary sectional view showing the example of a configuration of the optical recording medium of this invention.
[Description of Notations]
1 Optical Recording Medium
2 Substrate
3 Lower Dielectric Layer
4 Record Layer
5 Up Dielectric Layer
6 Reflecting Layer
7 Protective Layer

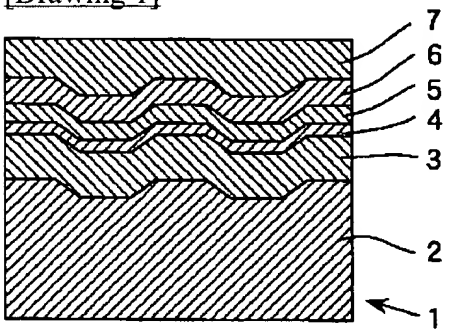
[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



[Translation done.]